
A New Species of *Orinus* (Poaceae) from Qinghai, China

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ABSTRACT. A new species of *Orinus* Hitchcock, *O. alticulmus* L. B. Cai & Tong Lin Zhang, is described and illustrated. This species is endemic to Qinghai province, China, occurring at altitudes of 2450–2600 m on sandy soils. It resembles *O. kokonorica* (K. S. Hao) Tzvelev, but differs from that species by its slightly effuse panicles, longer spikelets usually with five or six florets, purple-yellow anthers, shorter caryopses, and the paleas usually longer than the lemmas. A key to the five species of the genus is provided.

Key words: China, IUCN Red List, *Orinus*, Poaceae.

Orinus Hitchcock was established in 1933 based on *O. arenicola* Hitchcock, which was collected from the Kashmir region. Later, another species of *Orinus*, *O. anomala* Keng ex Keng f. & L. Liou, was discovered by Keng (1957, 1959), and the name was validated by Keng and Liou (1960). However, Bor (1960) cited *O. arenicola* in the synonymy of *O. thoroldii* (Stapf ex Hemsley) Bor, which was described from Xizang (Stapf, 1894). The type species of *Orinus* shifted to *O. thoroldii*, and subsequently, Tzvelev (1968) transferred *Cleistogenes kokonorica* K. S. Hao to *Orinus*, viz. *O. kokonorica* (K. S. Hao) Tzvelev, with Zhao (1994) describing a new species, *O. tibeticus* N. X. Zhao, from Xizang. Now, the genus *Orinus* contains altogether four taxa.

The four species of *Orinus* are restricted to the Qinghai-Xizang Plateau in Central Asia and are endemic there. They usually grow along riverbanks, lakesides, mountain slopes, and grasslands at elevations of 2230–5200 m, and have tender culms and leaves and well-developed, perennial root systems in gross morphology. Therefore, all members of the genus are used as forage grasses in animal husbandry and as a binder and stabilizer of shifting sands and soils at these high altitudes. It is because of the economic importance of *Orinus* that we have studied the genus since 2004. As a part of this research, we have checked

all specimens of *Orinus* preserved in the HNWP herbarium. As a result, several specimens belonging to a previously unrecognized or misdeemed taxon of *Orinus* were found. In autumn 2005, we also collected some specimens in the Xi Mountains, Xining, Qinghai, China. Subsequently, through the comparison of the morphological features of these new specimens with those of the other four species, we confirmed that this taxon represents a new species of *Orinus*. Especially notable, it has taller culms, to as much as 75 cm, which differ from those of the other known species of the genus.

Orinus alticulmus L. B. Cai & Tong Lin Zhang, sp. nov. TYPE: China. Qinghai: Xining Shi, Yangjiazhai, near Xining Botanical Garden, ca. 36°36'N, 101°48'E, 2450 m, 14 Aug. 1985, Y. H. Wu 1913 (holotype, HNWP; isotype, PE). Figure 1.

Herbae perennes, rhizomatosae; culmi (28–)40–75 cm alti, sub nodis pubescentes. Laminae utrinque glabrae. Paniculae leviter effusae, 6–20 cm longae. Spiculae stramineae, 8–10 mm longae, 5- ad 6-florae; glumis lanceolatis, glabris, dorso carinatis, margine membranaceis, apice obtusis, gluma prima 1-nervi, 4–5 mm longa, gluma secunda 3-nervi, 4.5–6 mm longa; lemmatibus 3-nervibus, dorso leviter carinatis, secus vel juxta carinas et nervos sparsim pilosis, lemmate primo 4.5–5.5 mm longo; paleis lemmatibus generatim longioribus; antheris purpureoflavis. Caryopsides 2.2–2.6 mm longae.

Perennial herbs; rhizomes 4–13 cm, 1–3 mm diam. at the base, densely lepidote, with short internodes; culms erect, loosely caespitose, (28–)40–75 cm tall, 1.3–2.2 mm diam., 5- to 6-noded, pubescent under the nodes. Leaf sheaths glabrous, longer than the internodes; ligules membranous, rather short, laciniate; leaf blades flat or involute, 8–14 cm × 2–3.5 mm, glabrous abaxially and adaxially. Panicles slightly effuse, 6–20 cm, with 4 to 7 racemose branches; branches solitary, scabrous, 1–5 cm. Spikelets stramineous, 8–10 mm, 5- to 6-flowered; rachilla internodes pubes-

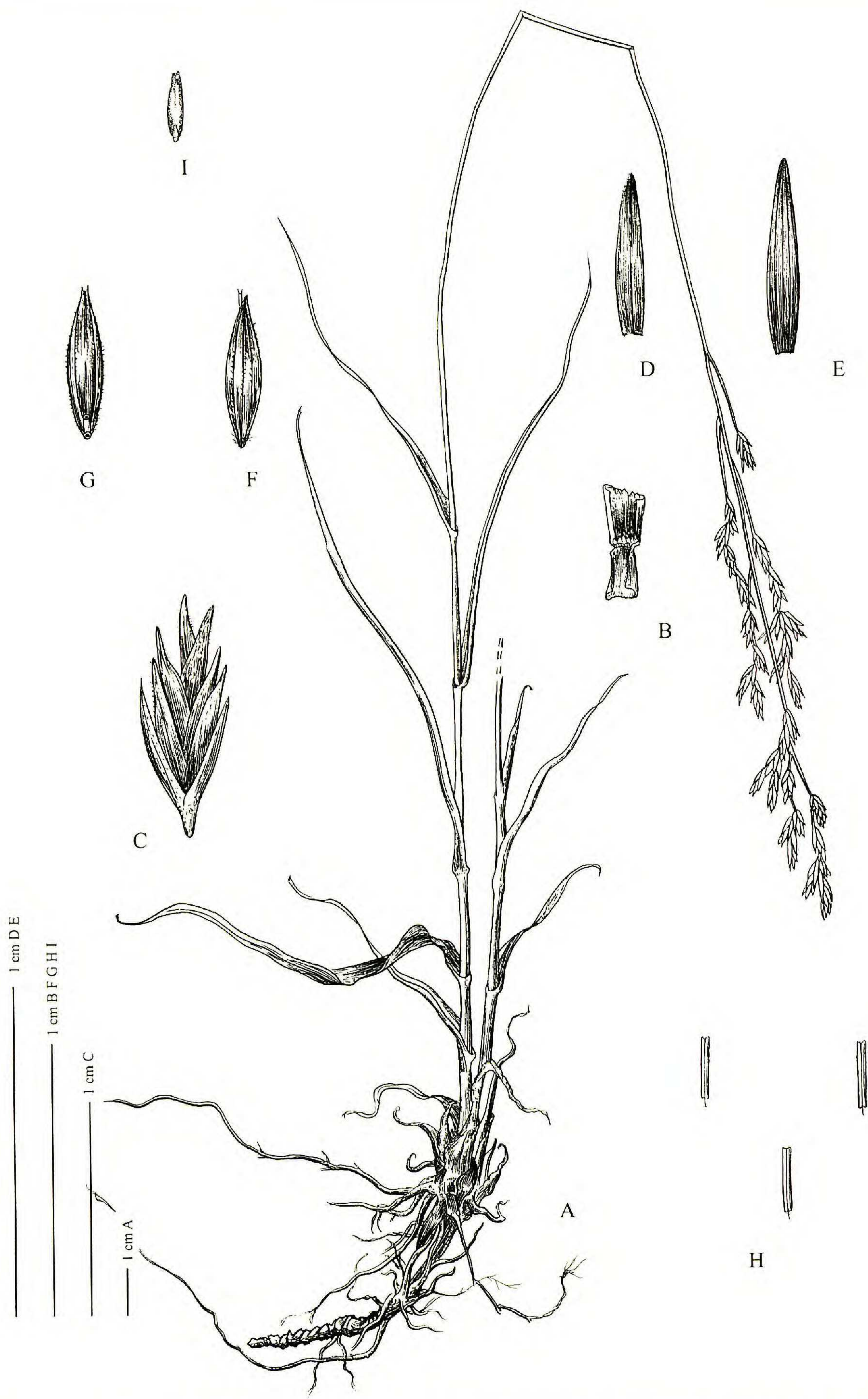


Figure 1. *Orinus alticulmus* L. B. Cai & Tong Lin Zhang. —A. Mature plant with rhizome. —B. Junction of sheath and blade showing ligule. —C. Spikelet. —D. First glume. —E. Second glume. —F. First floret, dorsal view. —G. First floret, ventral view. —H. Anthers. —I. Caryopsis. Drawn from the holotype Y. H. Wu 1913 (HNWP).

cent, ca. 1 mm; glumes lanceolate, glabrous, keeled on the back, membranous along the margins, obtuse at the apex, shorter than adjacent florets; the first glumes 1-nerved, 4–5 mm, the second glumes 3-nerved, 4.5–

6 mm; lemmas lanceolate, slightly keeled on the back, 3-nerved, sparsely pilose along or near the keels and veins, obtuse at the apex; the first lemmas 4.5–5.5 mm; paleas generally longer than the lemmas, with

Table 1. Morphological differences among five *Orinus* species.

Character	<i>O. anomala</i>	<i>O. alticulmus</i>	<i>O. kokonorica</i>	<i>O. thoroldii</i>	<i>O. tibeticus</i>
Plant	15–50 cm tall, culms and leaves pubescent at some parts	(28–)40–75 cm tall, only culms pubescent at some parts	20–50 cm tall, only leaves spinulate at some parts	12–50 cm tall, culms and leaves villose at some parts	15–35 cm tall, culms and leaves villose at all parts
Rhizome	usually 1.5–8 cm, 1–2 mm diam. at the base	usually 4–13 cm, 1–3 mm diam. at the base	usually 3–10 cm, 1–2 mm diam. at the base	usually 5–15 cm, 1–3 mm diam. at the base	usually 4–13 cm, 1.5–3 mm diam. at the base
Panicle	linear, 3–10 cm	slightly effuse, 6–20 cm	linear, 5–19 cm	slightly effuse, 4–15 cm	slightly effuse, 3–9 cm
Spikelet	stramineous or glaucous, 5–6 mm, only 1- to 2-flowered	stramineous, 8–10 mm, usually 5- to 6-flowered	viridescent or stramineous, 6.5–8.5 mm, usually 2- to 4-flowered	dark brown or purplish brown, 6–8.5 mm, usually 2- to 4-flowered	dark brown or purplish brown, 8–11 mm, usually 5- to 8-flowered
Glume	glabrous, first glumes 3–4 mm, second glumes 4–4.5 mm	glabrous, first glumes 4–5 mm, second glumes 4.5–6 mm	glabrous, first glumes 3.5–5 mm, second glumes 4–6 mm	glabrous, first glumes 4.5–6 mm, second glumes 5–7 mm	glabrous or sparsely pilose, first glumes 4.5–5.5 mm, second glumes 5–6 mm
Lemma	sparsely pubescent, first lemmas 4–5 mm	sparsely pilose, first lemmas 4.5–5.5 mm	sparsely pilose, first lemmas 4.5–5.5 mm	densely or sparsely villose, first lemmas 5–6.5 mm	densely villose, first lemmas 5–6 mm
Palea	equal to or slightly shorter than the lemmas	usually longer than the lemmas	subequal to the lemmas	slightly shorter than the lemmas	equal to or slightly shorter than the lemmas
Anther	orange, 1.5–2.1 mm	purple-yellow, 1.5–2.4 mm	yellowish, 1.6–2.6 mm	yellow or purple-yellow, 2–3 mm	yellow, 2.7–3 mm
Caryopsis	1.8–2.5 mm	2.2–2.6 mm	2.6–3 mm	2.4–3 mm	2.4–2.9 mm

emarginate apex, sparsely pilose along and near 2 keels; anthers purple-yellow, 1.5–2.4 mm. Caryopses brown, narrowly oblong, 2.2–2.6 mm.

Distribution and habitat. *Orinus alticulmus* is known only from three localities in Gonghe and Xining regions in the eastern part of Qinghai province, China. The type locality is a woodland at 2450 m in altitude. Two paratypes were collected from a grassland about 5 km distant from the type locality, at ca. 2500 m. An additional two specimens were found on mountain slopes at 2600 m in altitude. All three localities have sandy soils.

IUCN Red List category. Because the geographic range of *Orinus alticulmus* is estimated to be less than 10,000 km² and its range is fragmented and limited to the sandy soils of fewer than four localities, we preliminarily classify this species as Endangered (EN) according to IUCN Red List criteria (IUCN, 2001).

Etymology. The specific epithet is from the Latin “altus” and “culmus,” referring to the tall culms of the new species.

Relationships. *Orinus alticulmus* is classified in the genus *Orinus* based mainly on its external characteristics (Hitchcock, 1933; Bor, 1952; Keng, 1957, 1959; Liou, 1987; Yang, 1990; Lu, 1999). Namely, the new species has long and lepidote rhizomes, 1- to 3-nerved glumes, pilose lemmas, and panicles composed of racemose branches, and it grows on sandy soils. The new species is most similar to *O. kokonorica* by its longer panicles (up to 20 cm), glabrous and keeled glumes, and sparsely pilose lemmas. However, the new species clearly differs from the four established species in the genus (Table 1). For example, it differs from *O. anomala* in the shape of the panicle and number of florets; it differs from *O. tibeticus* in the length of the panicle and types of hairs of the lemma; and it differs from *O. thoroldii* in the number of florets per spikelet and the length of the palea. Furthermore, *O. alticulmus* is distinguished from the closely related *O. kokonorica* by its slightly effuse panicles, longer spikelets (8–10 mm) usually with five or six florets, purple-yellow anthers, often shorter caryopses (2.2–2.6 mm), and the paleas usually longer than the lemmas. *Orinus alticulmus* especially differs from all species of the genus by its taller culms (usually 40–75 cm). These species can be distinguished by the key provided here.

Paratypes. CHINA. **Qinghai:** Xining Shi, Xi Mtns., Xishanlinchang, ca. 2500 m, 13 Aug. 1985, *Veget. Geogr. Exped.* 889 (HNWP); 2 Aug. 2005, L. B. Cai & B. H. Ma 001 (HNWP); Gonghe County, Longyangxia, 2600 m, 17 Aug. 1983, *Longyangxia Exped.* 002, 019 (HNWP).

KEY TO THE SPECIES OF *ORINUS* IN CHINA

- 1a. Lemmas densely villose, the first lemmas 5–6.5 mm long; spikelets dark brown or purplish brown. 2
- 1b. Lemmas sparsely pilose, the first lemmas 4–5.5 mm long; spikelets usually stramineous or viridescent. 3
- 2a. Spikelets 6–8.5 mm long, usually 2- to 4-flowered; culms and leaves villose at some parts. . . *O. thoroldii*
- 2b. Spikelets 8–11 mm long, usually 5- to 8-flowered; culms and leaves villose at all parts. *O. tibeticus*
- 3a. Spikelets 5–6 mm long, only 1- to 2-flowered; lemmas sparsely pubescent. *O. anomala*
- 3b. Spikelets 6.5–10 mm long, usually 2- to 6-flowered; lemmas sparsely pilose. 4
- 4a. Panicles linear; spikelets usually 2- to 4-flowered; paleas subequal to lemmas; leaves spinulate in part. *O. kokonorica*
- 4b. Panicles slightly effuse; spikelets usually 5- to 6-flowered; paleas usually longer than lemmas; leaves not spinulate. *O. alticulmus*

Acknowledgments. The authors wish to thank Song Wen-zhu for preparing the excellent illustration, Ma Bi-hua for assistance with fieldwork, and Chen Chun-fang for making the type collections. This work was financially supported by the Knowledge Innovation Program of Northwest Plateau Institute of Biology, Chinese Academy of Sciences (grant CXZY-2003).

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